

MISCELLANEOUS.

On the Anatomy and Histology of Branchiostoma lubricum, Costa (Amphioxus lanceolatus, Yarrell). By M. J. MARCUSEN, of St. Petersburg.

It might be thought that, after the investigations of Johannes Müller and Quatrefages, there would be little to discover in the anatomy and histology of this curious animal. But as it is now nearly twenty years since these naturalists published their memoirs, and as since that time the means of research have been greatly improved, during my residence at Naples I submitted the *Branchiostoma* to a new examination, which has led me to the discovery of many facts unknown to my predecessors, and enabled me to rectify several of their results.

VERTEBRAL SYSTEM.

1. *Dorsal Chord*.—This is composed, as is well known, of a sheath and contents. The latter were described by Goodsir and Müller as consisting of a fibrous mass separable into disks. Quatrefages has denied the existence of the latter, and declared that the dorsal chord is composed of juxtaposed cells, of which he has given figures. According to my investigations, the cells do not exist; and Max Schultze has also been unable to discover them. The dorsal chord separates so readily into disks that they may be recognized even in the living animal, but the separation is not complete. The disks are very thin, their thickness being only $\frac{1}{250}$ th mill., and they are united on the two sides by a very delicate substance, which issues from the two surfaces at a great many points, so that in separating one disk from its neighbour the uniting membrane is torn, and its débris present a net-like appearance upon the surface of the disk, giving the latter an aspect of being composed of cells. In reality, however, there is only a smooth disk, of which the surface is covered with shreds of the uniting substance. Sometimes we may see in the substance of the disk itself several perfectly transparent nuclei. Perhaps the network of the uniting substance may represent the remains of cells; but otherwise there are no cells in the dorsal chord of the *Branchiostoma*.

2. *Buccal Cartilage*.—This cartilage, as well as its processes which form the skeleton of the buccal cirri, is also composed of a mass which separates readily into disks; but here the cells of which these are composed have not entirely disappeared, for nuclei of larger or smaller size are seen granulated into an intercellular mass. Quatrefages saw this; but he believed he saw cells without nuclei, with their outlines contiguous—which do not occur.

NERVOUS SYSTEM.

Quatrefages has the credit of having described the distribution of the nerves better than his predecessors; and it is also to him that we owe the interesting observation that the central nervous system is composed of a series of inflations corresponding with the origin of

the nerves; this I have been able to confirm. He has, however, left us in doubt as to the origin of the nerves; and with regard to their terminations his observations are very imperfect, which I attribute to the inferiority of the microscopes of 1844 as compared with those of 1862.

The central nervous system consists of cells and fibres. The cells are very delicate, transparent, round, and filled with granulations, and their diameter is from 0·02 to 0·05 mill.; their little nucleus is only 0·006 mill. in diameter. In the living animal I could not ascertain their presence; and I could only see them after placing the whole animal in a weak solution of chromic acid. The sheath of the central nervous system, discovered by Quatrefages, exists; but the nervous fibres, denied by him, also exist; they are very delicate, straight, and covered with small granulations.

Besides these two elements, there is a great quantity of capillaries in the central nervous system. Quatrefages discovered "that beyond the last inflation the *medulla spinalis* is produced into a delicate filament, which becomes dilated and forms a sort of very distinct ampulla on the level of the extremity of the dorsal chord." The observation is correct; but the ampulla and the whole of this terminal filament are nothing but capillaries, a loop of which forms the ampulla.

The spinal nerves spring from the upper part of the sides of the *medulla spinalis*, as I saw in transverse sections. From this the roots start in the form of a comparatively thick trunk. There are not two roots; but in the interior of the root we find very delicate primitive fibres (cylindraxes), which reach it from different sides. The roots are surrounded by a sheath, in which capillaries may be detected. After its issue the nervous trunk becomes swelled; and I once succeeded in seeing in this swelling a ganglionic cell with its nucleus. It is only behind the swelling that the trunk divides, as described by Müller and Quatrefages. I believe that the swelling represents the spinal ganglion of the vertebrata.

Termination of the Nerves.—Of this, Quatrefages saw two modes: in one he saw and depicted a nervous filament, "terminating in some small ovoid vesicular organs, with proportionally thick walls, which are probably muciparous crypts;" in the other he saw the nerves terminate in transparent homogeneous filaments, which at their very extremity "spread out to form an irregular cone, or a small mammilla applied against the inner layer of the integuments." The structures described by Quatrefages exist, but he observed only the beginning of the end. The little vesicular organs do not constitute a termination, but they are placed in the course of the last ramifications of the nerves. There are two kinds of these bodies—large and small. It is especially in the upper part of the head that I have seen them; in the lower part and in the margin of the fin they are much fewer. But these bodies, which at the first glance have the form of a nucleated cell, are only loops of the nervous fibre; that is to say, the fibre, instead of running straight onwards, turns round upon itself. Sometimes the arrangement is repeated, so that the

same fibre presents several points at which there are these bodies. Where they are large (having a diameter of from 0·012 to 0·020 mill.), the nerve upon which they occur is large. Besides the large bodies, there are smaller ones, only 0·006 mill. in diameter. Large and small loops are found upon the same nerve; but the small loops occur sometimes before and sometimes beyond the large ones. The terminations of the nerves are not in these loops.

In the *Branchiostoma* we have the great advantage of being able to examine the nerves from their origin to their extremities. The space traversed by them in the head is very small. Thus, if we take one of the three nerves which issue from the anterior extremity of the central nervous system, and which, running from above downwards, distributes itself in the lower part of the head, its length from its origin to its termination in the lower margin of the head is only $\frac{1}{4}$ mill. At the origin the trunk is not more than $\frac{1}{80}$ – $\frac{1}{40}$ mill. in thickness. At $\frac{2}{15}$ mill. from the origin this nerve divides into three branches, each of which is $\frac{1}{40}$ mill. in diameter. At $\frac{2}{15}$ mill. further on, each branch again divides, and each division is about $\frac{1}{80}$ mill. in thickness. At $\frac{1}{15}$ mill. further, there is another division into several filaments, each $\frac{1}{125}$ mill. in diameter. From this the residue of the divisions has still to traverse a distance of $\frac{6}{15}$ mill. to the lower margin of the head. The thickness of the nerves diminishes to $\frac{1}{250}$ mill.; and from these very delicate filaments the terminations arise, although some have already originated from the anterior trunks. The final terminations are very short branches—little cylinders, which issue from the two sides of the terminal trunks in great quantities, and which measure $\frac{1}{500}$ mill. in diameter and a little more in length. Up to this point, and including the terminal cylinders, the nerves have a transparent sheath with granular contents, which prevent our seeing the primitive nervous fibres which were readily detected in the roots of the nerves. In some places indeed something like fibres may be seen, but this is rare. But at the extremities of the cylinders we see issuing from their midst the terminal nerve-fibres, which are transparent, greyish, without the least trace of granules, and without a sheath. It is only with a power of 450 to 500 diameters that they can be clearly seen. But in order to trace their ultimate distribution a power of 750 diameters is necessary. The terminal fibre, a cylinder, measuring 0·0005, 0·0008, and 0·001 mill. in diameter, divides afresh, and becomes a little dilated on issuing; from these inflations, which contain neither nucleus nor granules, issue fibres which run to other small inflations, and so on. In this manner is formed a network, which I at first believed to be terminal; but sometimes, on slightly moving the screw of the microscope, I have seen starting, from what I thought to be the end, other filaments which I could trace no further.

I have said that the cylindraxes divide after issuing from the terminal cylinders; but the primitive fibres of the trunks must also divide. At the origin there are only from five to seven primitive fibres. In forming the terminal cylinders, of which the number amounts to twenty, thirty, or even more, the primitive fibres must subdivide.

Retzius, Müller, Kölliker, and Quatrefages speak of two eyes; Schultze only found a single one. By examining numerous individuals we find that some have two eyes, whilst others have only one. —*Comptes Rendus*, March 7, 1864, p. 479.

Recent Discovery of Fossil Human Remains near Abbeville.

The 'Abbevillois' of the 19th July contains a long account of recent discoveries of human remains in the valley of the Somme, not by the questionable intervention of the labourers, but by the personal exertions of M. Boucher de Perthes and his friends. At Moulin-Quignon, where the celebrated jaw was found, M. Boucher de Perthes has obtained numerous bones of men and animals from depths of from 2 to 4 metres in undisturbed beds; and on the 24th of April in the present year, Dr. Dubois and he found numerous fragments of bone in the yellowish-brown bed, 2 metres from the surface; and 60 centimetres lower down Dr. Dubois caught sight of an imbedded bone which proved to be a human sacrum. In the *sable aigre* in another part of the quarry, a bed so hard as to render the pickaxe necessary, a human tooth was seen fixed in its sandy matrix, and was extracted by M. Boucher de Perthes.

On the 1st of May the same gentleman found, at a depth of 2½ metres in the ferruginous bed, three fragments of a cranium in very bad condition, but probably human. The grey bed furnished, with some other bones, a fragment of a human tooth. On the 12th of May, M. Hersent-Duval, in company with MM. Boucher de Perthes and Dubois, extracted a fragment of a human cranium from its place at a depth of 2·30 metres.

On the 17th of May the party was joined by M. Martin and the Abbé Dergny, when they found and extracted a human cranium, which is said to be remarkably depressed at the summit. None of the party doubted that this bone had occupied the position in which it was found ever since the formation of the bed.

On the 9th of July the examining party was increased in number by several members of the *Société d'Emulation* of Abbeville, and again several fragments of human bones were seen in place and extracted. On the 16th a still larger body, including M. Buteux and M. de Mercey (the latter having come on purpose from Paris), proceeded to the scene of operations; the digging was continued down even to the surface of the chalk, and several human bones were found, one of them at the very bottom of the deposit, upon the chalk itself.

Among the human bones found are two fragments of the upper jaw and an almost entire lower jaw; the latter was obtained at a depth of 4·30 metres, and 22 metres from the resting-place of the jaw found on the 28th of March 1863, which the newly discovered bone is said to resemble in its form.

Discovery of Fossil Stone Implements in India.

At a recent meeting of the Royal Asiatic Society of Bengal, Professor Oldham exhibited a small collection of stone implements which had very recently been discovered by Messrs. King and